

2003

**International Energy Conservation
Code**

**Residential Applications
Handout**

Instructions for Residential Energy Code Compliance Reports

Rev 11/04/05

Purpose:

This code was designed to conserve our national resources and to defray the ever-increasing energy consumption and costs to the home owner. The Federal Department of Energy has mandated that all new construction meet or exceed the minimum requirements of the 2003 International Energy Conservation Code. In conjunction with this mandate, all of the jurisdictions in the Las Vegas valley have adopted this code as law and require that all new structures permitted after August 1, 2005 meet the requirements of this code.

What is Required?

The contractor/owner is required to provide two copies of all construction plans and documents. A Residential Energy Code Synopsis (attached) must be provided on the cover sheet of the plans adjacent to the building code analysis, and the Residential Energy Code Prescriptive Worksheet or Component Performance Worksheet must be filled-out and provided, (depending on which method of compliance chosen. In all cases the construction plans must clearly reflect the information that is being provided on the worksheets.

Methods of Compliance:

The contractor/owner may choose to comply with this code in ONE of several ways by either using the prescriptive compliance or component performance analysis methods. (Pick one method and comply).

- Method 1 is the Prescriptive Method for Residential Room Additions and Window Replacements for One and Two-Family Dwelling Units derived from IECC Sec. 502.2.5. This method can only be used for room additions to the above types of residences with total new conditioned space of less than 500 square feet, and for the replacement of existing windows in residences. Per this simple prescriptive method, the contractor merely uses the information in Table 1 below and designs to (at least) the minimum stipulated building components required to meet the code.
- Method 2 is the Simplified Prescriptive Method for One and Two-Family Dwellings, derived from IECC Chapter 6. The contractor must conform to or exceed the minimum building component requirements set forth in Table 2 below.
- Method 3 is the Individual Component Prescriptive Method, and the minimum required components of the energy envelope (exterior walls and roof) are derived using a formula that weighs into it the amount of window area used in construction. (This method is based on the premise that the less window area there is, the less chance for heat gain or loss and air leakage and, therefore, the less the energy loss must be "made up" by the wall and roof components. (See below for information as to how to perform the necessary calculations to arrive at the prescribed components for a particular project.)
- With Method 4, the Component Performance Analysis, the user calculates the minimum energy efficiency rating requirement of the code for the proposed space and attempts to meet or exceed this minimum efficiency rating with his proposed design components. The calculations must be done per IECC Sec. 502.2.1 and the attached work sheet.

Note: Use of *REScheck*--This component performance analysis is greatly simplified by utilizing the free *REScheck* software available on the DOE web link, [energycode.pnl.gov/REScheckWeb/] in lieu of a calculations worksheet. In this program, the designer may manipulate the various building energy components in order to provide the most compliant and desirable building envelope. After the desired result is achieved, and the

construction is clearly shown to meet or exceed the code standard, the entire report must be printed out and submitted with the plans package, in duplicate, to the building department.

Compliance with this code will insure that you will have comfortable, energy efficient living environment.

Room Addition Prescriptive Method #1

Table 1
Prescriptive Envelope Components Criteria
Additions of Under 500 Square Feet and Replacement Windows

Maximum	Minimum					
Window and Glazed Door U-factor	Ceiling R-value	Wall R-value	Floor R-value	Basement wall R-value	Slab perimeter R-value	Crawl space wall
0.50	R-30	R-13	R-19	R-8	Not required	R-10

Note 1: Sunrooms shall be required to have a maximum fenestration (window) U-factor of 0.50. The minimum ceiling R-value shall be R-19 and the minimum wall R-value shall be 13.

Note 2: The maximum solar heat gain coefficient allowed for window in this climate zone is SHGC=0.40.

Fill out the attached IECC Energy Code Synopsis sheet attached and sign. Submit two copies of this document with your plans.

Simplified Prescriptive Method #2

Table 2
Simplified Prescriptive Building Envelope Thermal Criteria
Minimum Required Thermal Performance (U-factor and R-value)

Maximum	Minimum					
Window and Glazed Door U-factor	Ceiling R-value	Wall R-value	Floor R-value	Basement wall R-value	Slab perimeter R-value	Crawl space wall
0.65	R-30	R-13	R-11	R-5	Not required	R-6

Note 1: The maximum solar heat gain coefficient allowed for windows in this climate zone is SHGC=0.40.

The components used in your project must meet or not exceed the maximum U-factor of 0.65, and must meet or exceed the minimum R-values presented in the above table. Fill out the attached IECC Energy Code Synopsis sheet attached and sign. Submit two copies of this document with your plans.

Individual Component Prescriptive Method #3

On the attached Prescriptive Method 3 worksheet provided, calculate the percentage of window openings to gross wall area:

Calculate the gross exterior wall area of the new construction that surrounds heated or cooled spaces only (measure from slab surface to a point where the vertical wall insulation meets the horizontal ceiling insulation. Multiply this times the length of each wall segment. Add all of these wall areas together. This is your gross wall area.

Calculate the rough openings for all the windows and glazed doors within these above wall areas.

Divide the total area of the rough openings by the total gross wall area to get the percentage of window-to-wall area.

Locate the line of Table 3 that matches this percentage. The components listed on this line are the required components for the project.

Fill in the Energy Code Synopsis form provided and sign it. Provide two copies of all documents to the building department with your plans.

Table 3

% of windows to walls	Maximum U-factor allowed	Maximum Solar Heat Gain Coefficient SHGC	Minimum Ceiling R-value	Minimum Exterior wall R-value	Minimum Floor R-value	Minimum Basement wall R-value	Minimum Crawl space Wall R-value
1% to 8%	0.90	0.40	R-19	R-11	R-11	R-5	R-6
9% to 12%	0.65	0.40	R-19	R-13	R-11	R-5	R-6
13% to 15%	0.65	0.40	R-30	R-13	R-11	R-5	R-6
16% to 18%	0.55	0.40	R-30	R-13	R-11	R-5	R-6
19% to 20%	0.52	0.40	R-38	R-13	R-11	R-5	R-6

Note that all components of the energy “envelope” construction must be labeled as to their energy efficiency values. That is, all windows must have the NFRC energy label clearly pasted to the window glass, and all insulation must be stamped to clearly show the R-value. (If windows are unlabeled, see default values table below. In the case of blown-in insulation, the packages must be labeled and saved for inspection.)

Regarding windows:

In the case that windows and glazed doors planned for the project have different U and SHGC values, the overall weighted average of these components must be calculated and used, but this average cannot exceed the listed values from the prescribed value in the prescriptive tables. (Multiply the U-value of each window and glazed door times the area of unit. Add these numbers together. Then add the total areas of all of these separate components. Divide the first number by the second to get the weighted U-value of all windows and glazed doors.

Example:

You have three 3050 windows and one 3068 glazed door you are going to use on the project. The U-values of two of the windows is 0.68 and one is 0.87. The U-value of the glass door is 0.98. The area of the windows is 15 sq. ft. each. The area of the door rough opening is 21 square feet. The weighted average is calculated as follows:

$0.68 \times 15 \text{ sq. ft.} \times 2 \text{ windows} = \underline{20.40}$; $0.87 \times 15 \text{ sq. ft.} = \underline{13.5}$; $0.98 \times 21 \text{ sq. ft.} = \underline{20.58}$.

$$20.40 + 13.5 + 20.58 = 54.48$$

The total area of these openings is: $(15 \text{ sq. ft.} \times 3) + 21 = 66 \text{ sq. ft.}$

Therefore the weighted average U-value of these openings is $54.48 / 66 \text{ sq. ft.} = 0.83$

In the above example, per Table 3 above, this weighted average U-value would only be acceptable if the ratio of window opening to added exterior wall area is less than 8%. If you are exceeding this prescribed U-value, then you would be required to buy better windows to bring the average down to meet the table's requirements.

Unlabeled Windows and Glass Doors:

If existing windows are to be re-used and are not provided with National Fenestration Rating Council labels, the designer must use the default values for the windows as listed in Tables 4, 5 and 6 below.

Table 4
SHGC Default Table for Fenestration

Product Description	Single Glazed				Double Glazed			
	Clear	Bronze	Green	Gray	Clear + Clear	Bronze + Clear	Green = Clear	Gray + Clear
Metal frames Fixed Operable	0.78	0.67	0.65	0.64	0.68	0.57	0.55	0.54
	0.75	0.64	0.62	0.61	0.66	0.55	0.53	0.52
Nonmetal frames Fixed Operable	0.75	0.64	0.62	0.61	0.66	0.54	0.53	0.52
	0.63	0.54	0.53	0.52	0.55	0.46	0.45	0.44

Note 1: The maximum allowable solar heat gain coefficient for this climate zone is SHGC=0.40

Table 5
U-Factor Default Table for Non-glazed Doors

Door Type	With Foam Core	Without Foam Core
Steel Doors (1.75 inches thick minimum)	0.35	0.60
	With Storm Door	Without Storm Door
Wood Doors (min. 1.75 inches thick)		
Hollow Core Flush	0.32	0.46
Panel with 0.438-inch panels	0.36	0.54
Panel with 1.125-inch panels	0.28	0.39
Solid core flush	0.26	0.40

Table 6
U-Factor Default Table for Existing Windows, Glazed Doors and Skylights

Frame Material and Product Type	Single Glazed	Double Glazed
Metal w/o thermal break: Curtain wall Fixed Garden window Operable: (includeing sliding and swinging glass doors) Site-assembled sloped/overhead glazing Skylights	1.22 1.13 2.60 1.27 1.36 1.98	0.79 1.69 1.81 0.87 0.82 1.31
Metal with thermal break: Curtain wall Fixed Operable (including sliding and swinging glass doors) Site-assembled sloped/overhead glazing Skylight	1.11 1.07 1.08 1.25 1.89	0.68 0.63 0.65 0.70 1.11
Reinforced vinyl/metal clad wood: Fixed Operable (including Sliding and swinging glass doors) Skylight	0.98 0.90 1.75	0.56 0.57 1.05
Wood/vinyl/fiberglass: Fixed Garden window Operable (including sliding and swinging glass doors) Skylight	0.98 2.31 0.89 1.47	0.56 1.61 0.55 0.84
Glass block (assembled with mortar but w/o reinforcing or framing)	0.60	

Residential Component Performance Method #4

Note: If you have on-line access, it is strongly suggested that you use free *REScheck* program available on DOE website in lieu of the calculation below(see above).

Fill out Component Performance Analysis worksheet (attached) in its entirety. Fill out the IECC Energy Code Synopsis. Provide two wet-singed copies of each with plans submittal to the building department.

Energy Code Synopsis for Residential—must be provided on the cover sheet of the plans adjacent to the Building Code Analysis

2003 International Energy Code Synopsis-Residential (Per approved calculations enclosed)	Building IECC Code Requirements
<p>Building Envelope:</p> <p>Attic Insulation R-Value: type 1: <u>R-_____</u> type 2: <u>R-_____</u></p> <p>Floors over unheated space: R-Values: <u>R-_____</u></p> <p>Wall Insulation : wall type 1: <u>R-_____</u> wall type 2: <u>R-_____</u></p> <p>Fenestration Components:</p> <p>Fixed windows: U-_____ SHGC: _____ Operable windows: U-_____ SHGC: _____</p> <p>Glass block: U-_____ SHGC: _____</p> <p>Glass Doors: Sliding Patio Doors: U-_____ SHGC: _____ _____</p> <p>_____ Glass Doors: U-_____ SHGC: _____ _____ French Doors: U-_____ SHGC: _____</p> <p>Solid Doors R-Values: R-_____</p> <p>Overhead door R-Value: R-_____</p> <p>HVAC: Type of System: Simple _____ Complex _____</p> <p>Description: _____</p> <p>Size of System: Heat: _____ Cool: _____</p> <p>Efficiency Ratings: Heat: _____ % AFUE Cool: _____ SEER</p> <p>Duct Insulation: Supply: R-_____ Return: R-_____</p> <p>Hydronic system: Pipe insulation: heat _____ in; cool _____ in.</p>	<p>Construction Documentation: An energy code compliance report must accompany plans for review. The information in this document must be accurately reflected on the building plans. All information provided will be field verified by the inspector.</p> <p>Insulation: All insulation shall be labeled. For blow-in products, one package must be save for field verification. Blow-in insulation certification must be provided prior to building final inspection.</p> <p>Batts shall not be compressed, and shall be split at electrical wiring and piping interruptions. Batts installed in walls with one side open shall be permanently held in place by wires, strapping or staples.</p> <p>Windows: All new windows and doors must display NFRC labels, clearly displaying U-values and SHGC coefficients (for glazed area) for field verification. Re-used/unlabeled windows or doors must meet minimum default values listed in code.</p> <p>Skylights: NFRC labels hall be clearly displayed, listing U and SHGC values. Skylight shafts shall be insulated with R-13 insulation, secured in place.</p> <p>Caulking and Sealants: Exterior joints, seams, or penetrations in the building envelope that are sources of air leakage, shall be sealed with durable caulking materials, closed with gasketing systems, taped or covered with moisture vapor-permeable housewrap. Provide caulking or sill seal at joint between sill plates of framed exterior walls and foundation. The space between framed rough openings and door or window frames must be foam insulated or caulked. Seal recessed lighting, plumbing, electrical box and wiring penetrations against air infiltration. Exterior doors must be weather-stripped. Insulate and seal behind tub and shower enclosures set against exterior walls. Attic access opening covers must be gasketed to prevent air leakage.</p> <p>HVAC System: Mechanical efficiency and capacity of new units must appear on equipment.</p> <p>Thermostats: Devices shall have a deadband range of 5° F within which the supply of heating and cooling energy is shut off or reduced to a minimum.</p> <p>Heat Pumps: Systems having supplementary electrical resistance heaters shall have controls that prevent the heater operation when the heating load is capable of being met by the pump.</p> <p>Ducts and Plenums: All supply and return-air plenums shall have all joints and connections securely fastened and sealed with welds, gaskets, mastics, mastic-plus-embedded-fabric systems or approved tapes.</p> <p>Duct and Plenum Insulation: Unless located in conditioned space, all supply ducts and plenums shall have minimum R-8 insulation. Return air ducts and plenums shall be insulated with minimum R-4 insulation</p> <p>Hot Water Heaters: Units shall be labeled as to their input rating and efficiency. Heat traps shall be installed on inlet and outlet side when vertical pipe risers are installed. Water heaters equipped with auto -circulating systems shall have all piping insulated. Water conserving shower heads shall be installed, 2.5 gal/minute maximum flow rate.</p>
<p>Water Service System:</p> <p>Type (X): electric: _____ gas fired: _____ instantaneous: _____</p> <p>Input Rating: _____ Btu/hr Storage capacity: _____ gal</p> <p>Efficiency Rating: _____ %</p> <p>Re-circulating pump (X): Yes _____ No _____</p> <p>(If yes) Temp setting: _____ degrees; Pipe insulation: _____ in</p>	

**INDIVIDUAL COMPONENT PRESCRIPTIVE METHOD #3
RESIDENTIAL COMPLIANCE WORKSHEET
FOR 2003 IECC**

Name or Address of Project: _____

Model (if tract housing): _____ CLV Plan Check No.: _____ - _____ - _____

Preparer's Signature: _____

WALL AREA CALCULATION

Calculate the gross wall areas for all exterior walls surrounding conditioned space (measure from slab surface to where wall insulation meets roof/ceiling insulation).

Wall #	Height	X	Width	=	Wall Area
1		X		=	
2		X		=	
3		X		=	
4		X		=	
5		X		=	
6		X		=	
7		X		=	
8		X		=	
9		X		=	
10		X		=	
11		X		=	
12		X		=	

Line A Total Gross Wall Area = _____

WINDOW AREA CALCULATION

Calculate the total area of wall windows, and doors with over 50% glazed area.

For windows with
different U-Values Only.

Window Type	Width	X	Height	=	Window Area sf	X	Quat	=	Total Area sf	X	U-factor	=	Weighed U-factor
1		X		=		X		=		X	0.	=	
2		X		=		X		=		X	0.	=	
3		X		=		X		=		X	0.	=	
4		X		=		X		=		X	0.	=	
5		X		=		X		=		X	0.	=	
6		X		=		X		=		X	0.	=	
7		X		=		X		=		X	0.	=	
8		X		=		X		=		X	0.	=	
Glass Door 1		X		=		X		=		X	0.	=	
Glass Door 2		X		=		X		=		X	0.	=	

Line B-----Total Area of all Window = _____sf

Line C-----
WINDOW TO WALL CALCULATION

Total Weighted
 U-factor = _____

Divide line B by Line A: _____ ÷ _____ = _____ % of windows

Refer to Table 3 on page 3 of instructions and fill in the information provided for the appropriate range line from the table into the corresponding spaces below (For example, if your window % above was 10%, copy in the information from line 2 of Table 3 on page 3)

% of Windows to walls	Maximum U-factor allowed	Maximum Solar Head Gain Coefficient SHCG	Minimum Ceiling R-value	Minimum Exterior Wall R-value	Minimum Floor R-value *	Minimum Basement Wall R-value	Minimum Crawl Space Wall R-Value

These are the minimum energy envelope component requirements for your project. You cannot exceed the values in this table. All components will be verified by the field inspector. Fill in the actual component values you will be using for your project in the Residential Energy Code Synopsis. Copy this synopsis directly onto the plans cover sheet next to the code analysis. Again, the values you place in the synopsis cannot exceed the values above.

* Rooms or spaces with over 25% of floor area directly exposed to the outside shall have R-30 insulation installed in the exposed floor space.

WEIGHTED U-FACTOR OF WINDOWS

When using any of the prescriptive methods (1, 2 or 3), the actual U-factors of the windows you will be using cannot exceed the prescribed U-factor from the table. If you are using windows with different U-factors, you must either consider the highest of the U-factors of all the windows you will be using, or, if you have some windows that are labeled with higher U-factors than the table allows, or have windows that are not labeled and therefore require default values from Table 4 of the hand-out, you may calculate the weighted average of all of your window U-factors and consider this result for compliance. To calculate the weighted U-factor of all of your windows, fill in the boxed section of the Window Area Calculation table above, and perform the following calculation:

Divide Line C _____ by Line B _____ = U-_____

This is the weighted average U-factor of all of your different types of windows. Again, the weighted U-factor must be lower or equal to the prescribed U-factor from respective Tables 1, 2 or 3 in order for you to comply. If you do not meet the prescribed criteria, you must either remove some of the windows to decrease the total glazed area, or decrease (better) the U-factors of various (or all) windows in order to meet the prescribed U-factor limit. Another way that you may wish to comply is to use Method 4, the component performance method, which allows component trade-offs.

METHOD 4
RESIDENTIAL COMPONENT PERFORMANCE ANALYSIS WORKSHEET
FOR THE CITY OF LAS VEGAS
2003 IECC

Name of Project: _____

Street Address or Tract Name: _____

Model Number (if Tract): _____ Preparer's Signature: _____

Description: This worksheet allows you to "trade off" components. That is, it allows you to use, say, less attic insulation if you are using more efficient windows, etc. Fill in the proposed components U- or R- values and do the calculations. The building passes if your project design beats the code standard design for an identical project. Having completed this worksheet successfully, provide your design components in an energy code analysis (see attachment) on the cover sheet of the plans page. All components must also be reflected in the building plans (i.e., the typical cut-section exterior wall-eave-attic-roof detail must depict the location and R-values of the insulation, etc). Window schedules must be on the plans and must list the Solar Heat Gain Coefficients and U-factors.

Building Thermal Envelope

Your House

Code House

ROOF/CEILING ASSEMBLY

1. Flat or vaulted area: _____ sf ÷ R-_____ = _____.
2. Cathedral _____ sf ÷ R-_____ = _____.
3. Other _____ sf ÷ R-_____ = _____.
4. Skylight _____ sf X U-0._____ = _____.

Add totals of lines 1+2+3+4

5. _____

A. Total Roof Area _____ sf X (0.375)

B. _____

WALLS (Area excluding window and doors with over 50% glazing).

6. Exterior (type 1): _____ ÷ R-_____ = _____.
7. Exterior (type 2): _____ ÷ R-_____ = _____.
8. Garage/House: _____ ÷ R-_____ = _____.
9. Solid Doors: _____ ÷ R-_____ = _____.
10. Other: _____ ÷ R-_____ = _____.

Your House

Code House

WINDOWS (Sq. Ft.)

11. Fixed (type 1): _____ sf X U-0._____ = _____.

12. Fixed (type 2): _____ sf X U-0._____ = _____.

13. Operable (type 1): _____ sf X U-0._____ = _____.

14. Operable (type 1): _____ sf X U-0._____ = _____.

15. Glzd. Doors (> 50% glass) _____ sf X U-0._____ = _____.

16. Glazed Doors (type 2) _____ sf X U-0._____ = _____.

17. Glass Block: _____ sf X U-0._____ = _____.

18. Other: _____ sf X U-0._____ = _____.

Add totals of lines 6 thru 18 **19. = _____.****C. Total wall and window area** _____ sf X U-(0.19) = **D. _____.****FLOORS** (Area over unheated spaces only)20. Floor area: _____ sf ÷ R-_____ = **20.** _____.**E. Total Floor Area** _____ sf X U (0.07) = **F. _____.****BASEMENT WALLS** (Total area more than 50% below grade)21. Walls: _____ sf ÷ R-_____ = **21.** _____.**G. (total basement wall areas)** _____ sf X U(0.15) **H. _____.****CRAWLSPACE WALLS**22. Wall area: _____ sf ÷ R-_____ = **22.** _____.**I. Total solid wall area** _____ X U-(0.135) = **J. _____.****Add total of bold lines (5+19+20+21+22) = 23.** _____.**Add total of bold lines (B+D+F+H=J)** **K. _____.****THE TOTAL On LINE 23 MUST BE LESS THAN OR EQUAL TO LINE K**